

# RoboShow



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# Project Background

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- Boeing donated Denso robots
- Develop robotics expertise
- Promote research
- Develop fully functional robot “work station”

# Project Deliverables

- Safety enclosure as per industry safety standards
- Robot control
- Design and integrate fully functional end effector



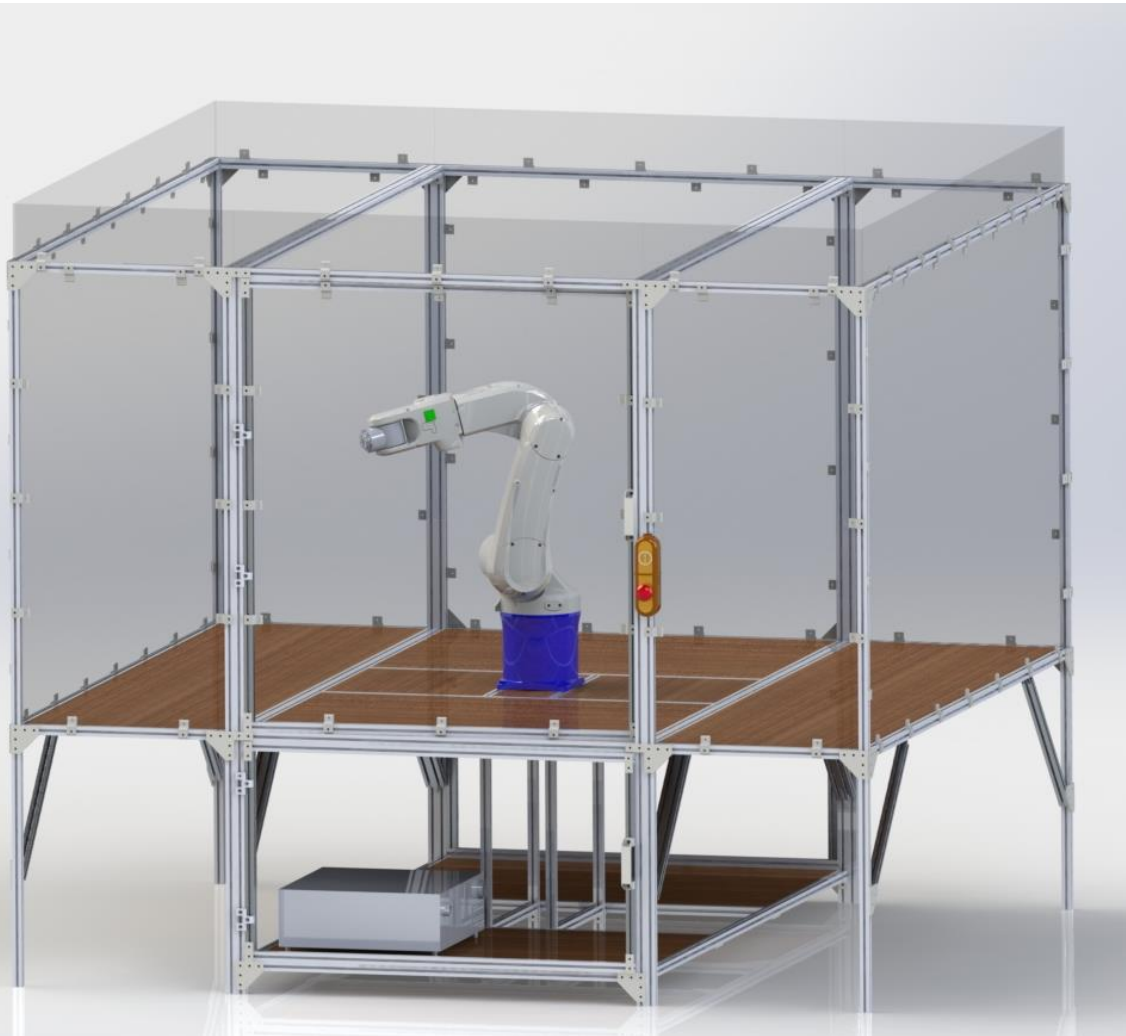
# Timeline

- Design Review – 2/21
  - Finalized enclosure design
  - End Effector design options
- 3<sup>rd</sup> Snapshot day – 3/11
  - End Effector Prototype
- Enclosures assembled – 3/31
- Engineering EXPO – 5/2
- Client handoff – 5/9
  - Operation Manual

# Progress Update

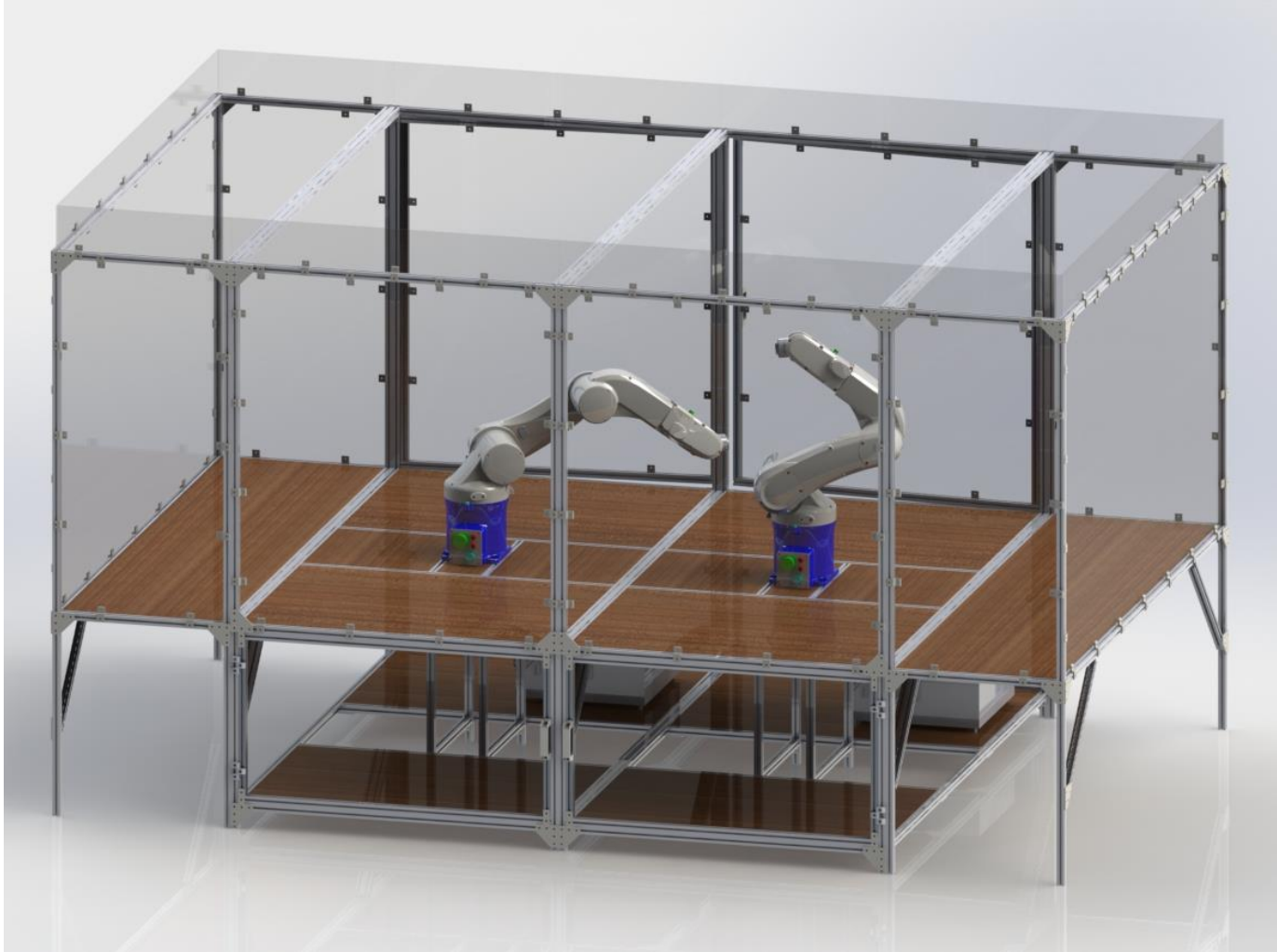
- Ordered Enclosure Materials
- Operate robot using Pendant in Manual and Auto Modes
- Programming and Modeling using WinCaps
- End-Effector concepts
- Videos:
  - <S:\\Engineering\\SeniorDesign\\- Senior Design\\2013-2014\\Robo-Show\\Pictures and Videos\\squares\\WP 20140214 004.mp4>
  - <S:\\Engineering\\SeniorDesign\\- Senior Design\\2013-2014\\Robo-Show\\Pictures and Videos\\squares\\WP 20140214 005.mp4>

# Final Enclosure Design-Single



- 3-Piece Shell Design
- 1" Aluminum 8020
- 1/8" Impact resistant polycarbonate walls
- Integrated electronics with safety features
- Modular design and portable
- Overall Dimension: 92" X 82" X 78"

# Final Enclosure Design-Double





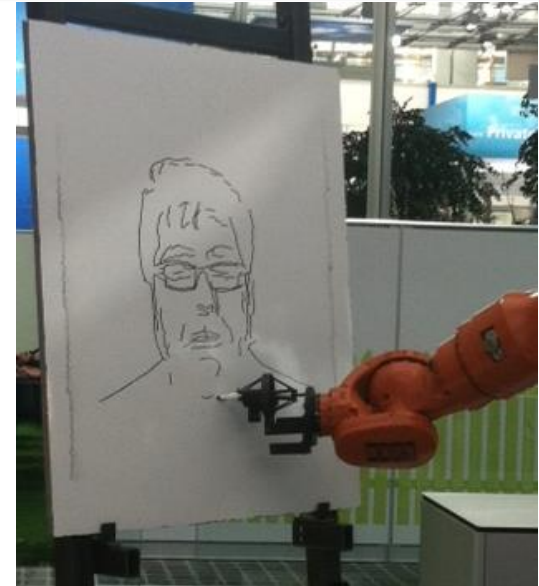
# Remaining Budget

Overall Budget	Description	Amount
Approved Budget	Engineering College approved Budget	\$11,000.00
Expenses		
	Teaching Pendant; WinCaps 3	\$3,326.31
	Five Blade Male Plug	\$36.95
	Safety E-Gards	\$1,218.00
	3-D Printer Filament	\$110.80
	Polycarbonate	\$973.95
	8020 Aluminum Components	\$3,491.20
	total shipping costs	\$701.00
Expenses Total		\$9,858.21
Remaining Budget		\$1,141.79
outstanding expenses	aluminum plate	\$10.00
	safety and mini I/O	\$135.00
	fasteners	\$150.00
	selector switch	\$50.00
	plywood/misc	\$100.00
Estimated remaining for End Effector		\$696.79

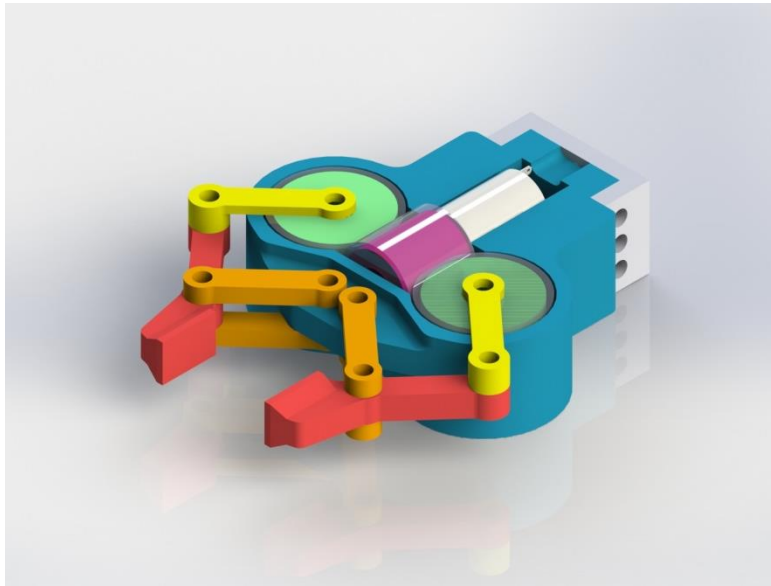


# Project Demonstration

- White board station
  - Draws an I, then erases
- Cup Station
  - Stacks and unstacks a cup pyramid
- Peg Station
  - Places Pegs in different holes

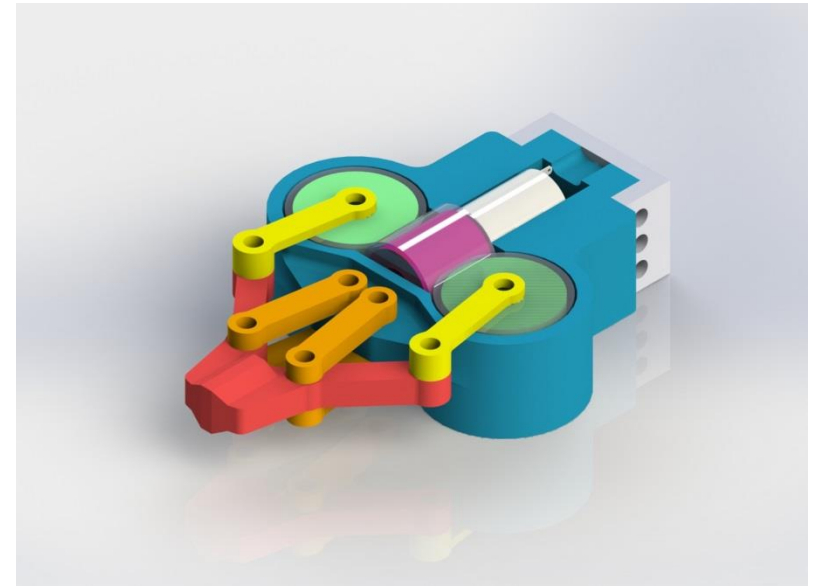


# End Effector Design #1: Rainbow Claw Design



Open View

Gripper Open Dimensions:  
Length – 5.6"  
Width – 2.5"



Closed View

Gripper Closed Dimensions:  
Length - 6.8"  
Width - 0"

# End Effector Design #1:

## Pros and Cons

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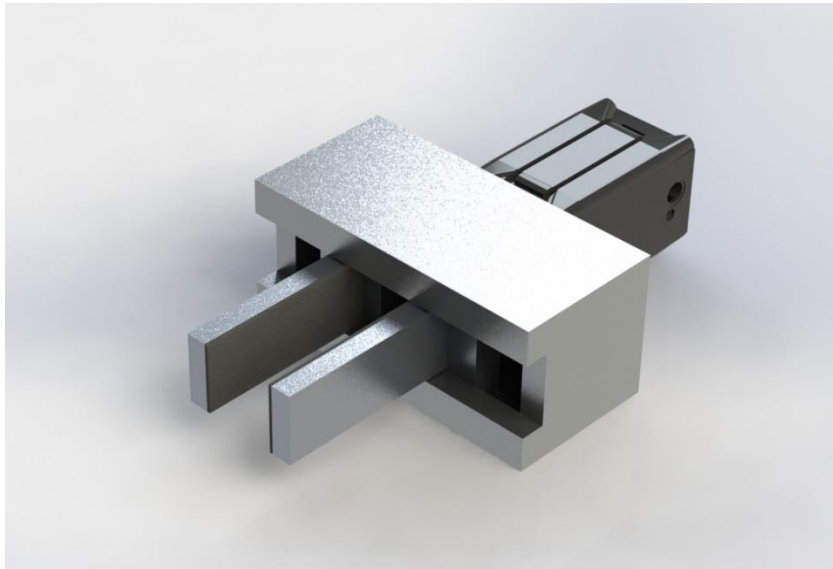
### PROS

- Completely closes
- Not back drivable
- Shorter length
- More compact design

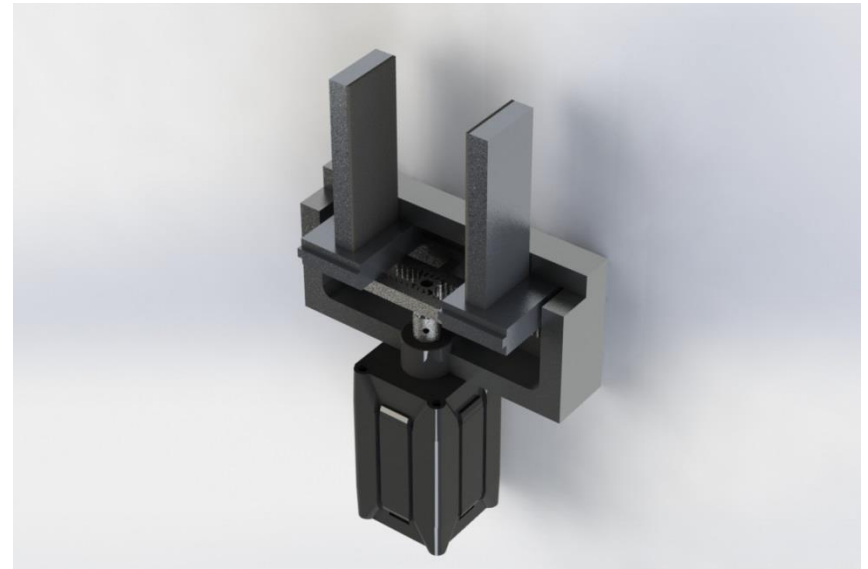
### CONS

- Gripping point of contact varies based on object size
- Complex design
- More points of failure

# End Effector Design #2: Linear Actuator Design



ISO View



Internal View

Gripper Dimensions: Length – 9.7"

Width – 6.0"

Gripping Spread: .7"-3"

# End Effector Design #2:

## Pros and Cons

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### PROS

- Easy expansion
- Constant point of contact
- Less components
- Simple design

### CONS

- Can't close all the way
- Actuation not as smooth
- Larger design

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**Questions?**